PROCENTEC

User Manual

SIO4DP

PROFIBUS Simple 4 bit I/O Slave

Full-featured PROFIBUS slave, 4bits I/O
Supports PROFIBUS DP-V0 / V1
Educational / training features
Input and Output simulation

Version 1.1 – February 2014

PROCENTEC

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Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning sign and are marked as follows according to the level of danger:

Draws your attention to important information on handling the product, a particular part of the documentation or the correct functioning of the product.

Warranty

Warranty is void if you open the SIO4DP.

Disclaimer of Liability

We have checked the contents of this manual as much as possible. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the content in this manual is reviewed regularly and necessary corrections will be included in subsequent editions. Suggestions for improvements are welcome.

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Important Information

Purpose of the Manual
This user manual provides information how to work with the SIO4DP.

Recycling and Disposal
The parts of the SIO4DP can be recycled. For further information about environment-friendly recycling and the procedure for disposing of your old equipment, please contact:

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1 Product description

1.1 Introduction

The SIO4DP is a simple PROFIBUS slave with 4 bits input and 4 bits output. It is designed as a fully functional industrial I/O module which can be used in many factory automation applications, but it also has some unique features for educational purposes that no other slave can offer.

1.2 Product features

- ✓ IP 20 with DIN-rail mounting
- ✓ PROFIBUS DP-V0 and DP-V1 communication
- ✓ DB9 connector
- ✓ Addressable range 0 – 126
- ✓ 4 bits input, 4 bits output
- ✓ Max. 12 Mbps, autodetect
- ✓ BF / SF / Diag system LEDs
- ✓ Failsafe mode
- ✓ Bus failure simulation mode
- ✓ Inverted output mode
- ✓ Input simulation mode
- ✓ Adjustable input update time

1.3 Application areas

- ❑ Any IP 20 factory automation remote I/O application
- ❑ Training kits and demo setups
- ❑ Certified PROFIBUS Engineer trainings or PROFIBUS Troubleshooting trainings

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2 Installation

Location
The SIO4DP can be installed everywhere in a non-hazardous area that complies with IP 20 (DIN 40 050) and the specified temperature range of -20 to +60 ° Celsius.

Position
The SIO4DP can be installed in every position, but it is recommended to install it with the inputs pointing down. In this position it is easier to read the status display.

Mounting and dismounting
The SIO4DP has to be mounted on a 35 mm DIN-rail with a minimum width of 75 mm.

Power supply (slave)
The power supply has to comply with the following specifications:
Voltage: **12 to 30 V DC**
Current: **Min. 65 mA**

Power supply (outputs)
The power supply for the outputs has to comply with the following specifications:
Voltage: **12 to 30 V DC**
Current: **Min. 65 mA**

Power supply (inputs)
The inputs have to comply with the following specifications:
Voltage: **12 to 30 V DC**
Current: **Min. 65 mA**

PROFIBUS connection
The DB9 connector must be used to connect the SIO4DP to the rest of the PROFIBUS network. Use a standard DB9 connector, suited for PROFIBUS, or use pin 3 (red), 8 (green) and the shield.

Address selection
The SIO4DP supports hardware and software addressing. For software addressing, refer to the ProfiCaptain section in the ProfiTrace manual. For hardware addressing, use the Dip switches located on the front of the slave and make sure the H/S switch is set to the left ('H', for Hardware). Use Dip switch 1 to 7 to set the desired address. Each switch has its own value:

Switch	Value
8	Hardware / software
7	64
6	32
5	16
4	8
3	4
2	2
1	1

Examples:
Address 5: switch 3 and 1 to ON (left)
Address 38: switch 6, 3 and 2 to ON (left)
Address 119: switch 7, 6, 5, 3, 2 and 1 to ON (left)

Power-cycle the slave; only at startup the slave will 'read' the dipswitches and take its new address.

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3 Inserting SIO4DP in a PLC project

The SIO4DP slave can be inserted into a PLC project as any other PROFIBUS DP slave by means of the GSD file, which is supplied through www.procentec.com. Download and install the GSD file in your configuration tool. The example below uses Siemens Step7.

3.1 Adding slave to Hardware Configuration

Create a new project with a PROFIBUS network. The baud rate is automatically detected by the slave so you can choose any baud rate without having to set it in the slave. Next, select the installed GSD file and drag it into the network, see **Figure 1**.

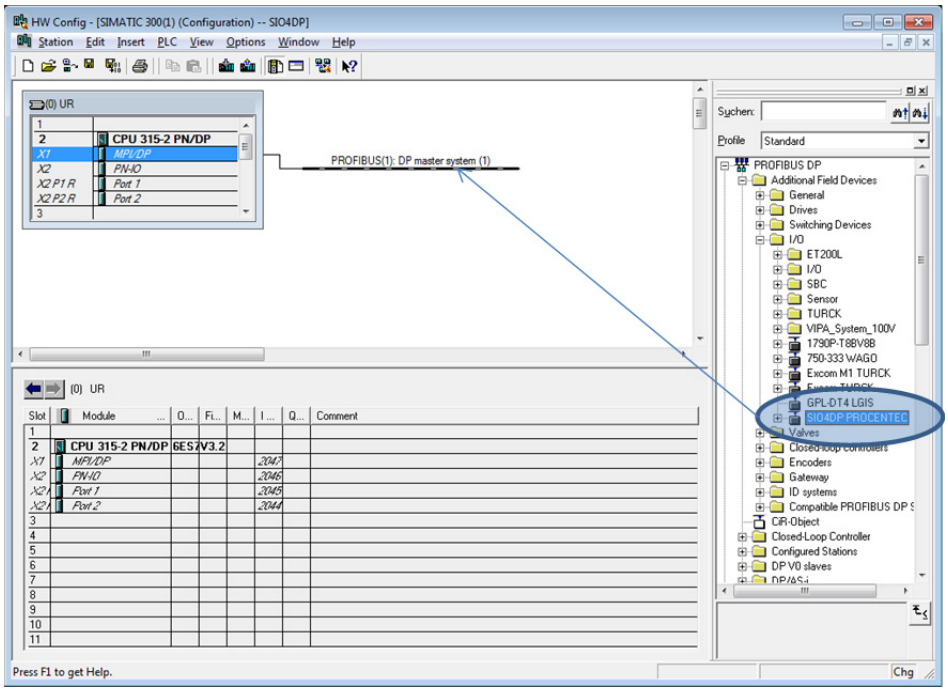

Figure 1 - Adding the slave to the network

In the next window that pops up you can enter the address:

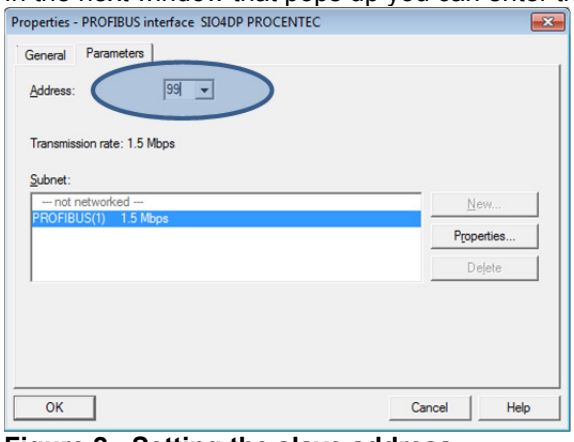

Figure 2 - Setting the slave address

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3.2 Adding hardware module

The SIO4DP supports only one module; the 4 bits I/O module. It is not possible to choose a different module. This makes it easy to configure.

Unfold the GSD file in the list on the right and select the '4 bits I/O' module, and drag it into the green highlighted slot as shown in **Figure 3**.

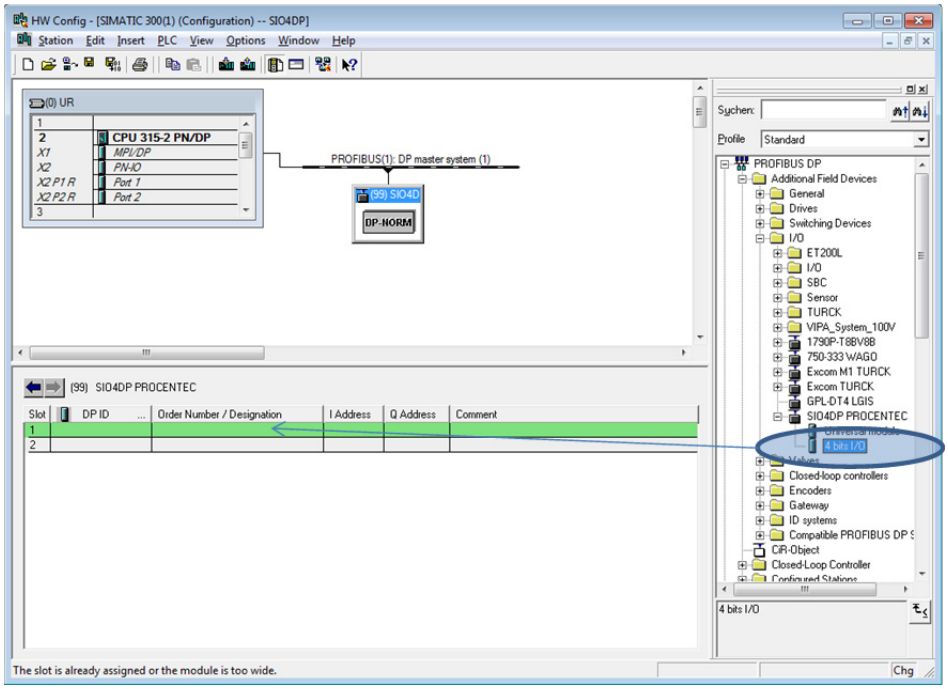

Figure 3 - Adding module into the slave

The configuration is now ready to be downloaded to the PLC. Choose 'Station - Save and Compile' and then 'PLC – Download' to send the configuration the PLC.

3.3 Changing device parameters

The SIO4DP has a unique feature that no other slave has; it can generate a bus fault by physically remove itself from the PROFIBUS after a certain time. This time can be defined in the slave by editing the device parameters in the GSD. This offers excellent facilities for trainings.

Double-click on the slave in the Hardware configuration to open the slave properties, and then unfold the 'Device-specific parameters'. There are two options: 'Bus failure simulation mode' and 'Bus failure simulation time (ms)'. Click on 'Deactivated' to see the available options and choose 'ACTIVATED' to enable the bus failure simulation mode. You can also set the time in milliseconds; after this time the slave will shortly go into bus failure. The minimum is 0 msec and the maximum is 1000000 msec.

After changing these settings, choose 'Save and Compile' and 'Download to PLC' again to activate the changes.

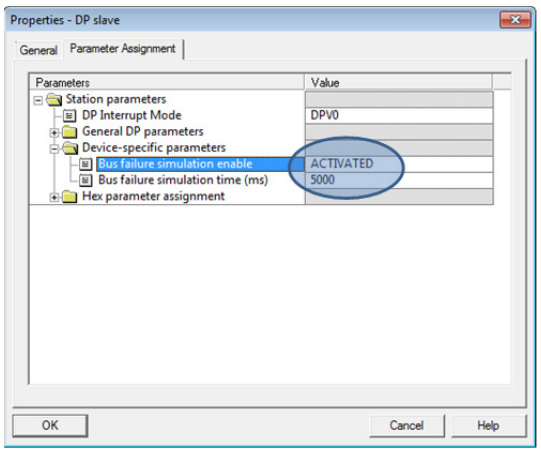

Figure 4 - Setting device parameters

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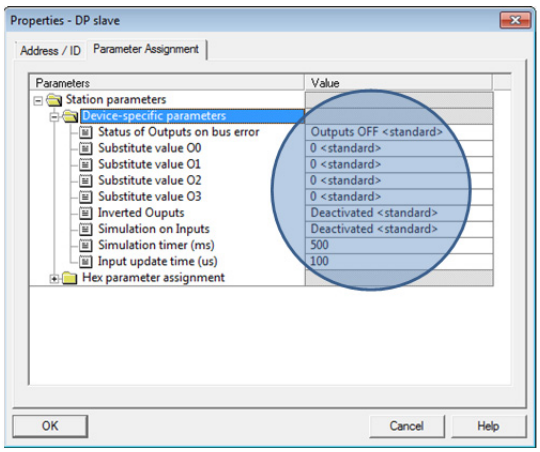
3.4 Changing module parameters

The I/O module in the SIO4DP has many features. These are accessible in the module parameters dialog box. Double-click on the 4-bits I/O module to open this dialog box.



3.4.1 Status of Outputs on bus error

This parameter defines what the outputs should do after the Watchdog (defined in the PLC) has expired. This Watchdog is a safety feature to ensure that, in the event of PLC or cable failure, the outputs can go to a safe state (e.g. pump on, motor off etc.).

The following options are available:

- Outputs OFF (default value)
- Outputs ON
- Switch to substitute value (where each output is definable)
- Hold last value (nothing changes)

If you choose ‘Switch to substitute value’ you can set each output state in the ‘Substitute value O0..O3’ boxes.

3.4.2 Inverted outputs

Enabling this option inverts the outputs, so when all outputs are set to ‘0’ the outputs are actually ON.

3.4.3 Simulation on Inputs

Enabling this feature overrides the real inputs, if any enabled. The inputs are simulated. The following patterns are available:

- Deactivated (default)
- Always ON
- Always OFF
- Blinking
- Up counter
- Down counter
- Zig-Zag
- Random

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- Pattern 1
- Pattern 2
- Pattern 3

When this mode is enabled, the slave will indicate External Diagnostics. The DIA LED will illuminate.

The speed of simulation can be adjusted by entering a value in the ‘Simulation timer’ in milliseconds. Minimum is 0 msec, maximum is 65535 msec.

3.4.4 Input Update Time

The frequency of updating the inputs can be altered by entering a value (in microseconds) in the ‘Input Update Time’ box. Minimum is 100 microseconds, maximum is 65536 microseconds.

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4 DP-V1 Slot and Index listing

Parameter	Slot	Index	Values
Output data as set by master	0	0	
Output data as read by the internal readback hardware	0	1	
Mask of the output pins where a short circuit/overcurrent is detected	0	2	
Status of the output power supply	0	3	0 = OK 1 = Not OK
Latest input sample	0	10	
Input simulation function as set in the parameters	0	11	
Decimal temperature of Outputs	0	20	
Decimal temperature of CPU board	0	21	
Current LED status	0	22	ON = 1 BF = 2 SF = 4 DIA = 8
Read device serial number	0	100	
Read 240 bytes	0	101	
Read 240 bytes	0	102	

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5 Technical data

Technical Data – PROFIBUS Slave SIO4DP (101-00221A)	
Protocol specifications	
Supported Protocols	DP-V0, DP-V1
Address	0 – 126 (set by hardware or software)
Transmission speed Transmission speed detection	9.6 kbps .. 12 Mbps (including 45.45 kbps) Auto detect
Maximum transferrable data	244 bytes input and 244 bytes output
PROFIBUS connection	
Connector type	DB9
A, B	Green wire, Red wire
Additional features	
Failsafe options	- All outputs off - All outputs on - Keep last value - Custom failsafe value
Automatic input patterns	On, off, blink, up counter, down counter, zig-zag, random, 3 other patterns
PROFIBUS cable specifications	
Cable lengths	1200 m at 9.6 kbps .. 93.75 kbps 1000 m at 187.5 kbps 400 m at 500 kbps 200 m at 1.5 Mbps 100 m at 3 Mbps .. 12 Mbps
Wire type Number of devices	Stranded or solid core Maximum 31 devices per channel (busloads)
LEDs	
OK (on)	Slave is powered and ready for operation
BF (on) BF (blinking)	Bus Failure: not in Data Exchange with master Bus Failure: not in Data Exchange, but slave is responding to FDL_Status_Req
SF (on)	Configuration not correct
DIA (on)	Slave has diagnostics

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Technical Data – PROFIBUS Slave SIO4DP (101-00221A)	
Ident Number GSD filename Operating temperature Weight MTBF	6960 PROC6960.gsd (see www.procentec.com/downloads) 0 .. 60 °C ? g To be defined
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7 Products and spare parts

Component	Order code	Remarks
SIO4DP	101-00221A	Slave unit including connectors

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8 About PROCENTEC

PROCENTEC is an independent company, concentrating all its products and services on PROFIBUS and PROFINET technology. Our main business is the export of in-house developed automation products through our worldwide distributor network. PROCENTEC is also providing vendor independent training and support to end-users.

We are an international PROFIBUS and PROFINET Competence/Training Center with all the required expertise available to realize our projects and services. We have the availability of some real experts whose knowledge makes us unique in the world. Because of our international recognition we are often contracted and offer a wide range of commercial services (consultancy, training, commissioning, maintenance and troubleshooting). PROCENTEC has 2 offices; the headquarters is based in The Netherlands and a sales office is located in Germany.

Testlab
PROCENTEC runs 1 of the 8 accredited test laboratories for the certification of PROFIBUS devices. In our laboratory vendors can have their products tested on PROFIBUS compatibility.

Product development and export
We develop in house PROFIBUS and PROFINET products that are being exported through our worldwide distributor network. Especially in the area of maintenance tools we have gained a unique market position.

Democenter
We have a demonstration facility, which is used for support, training, demonstrations, engineering and trade fairs. It consists of more than 250 devices from more than 40 vendors.

Training and Education
PROCENTEC is very successful with its training program. Up to now, more than 4000 participants have received a certificate. The costs incurred for engineering, assembly, commissioning and maintenance always play a key role when choosing a fieldbus. We train our participants that the implementation of PROFIBUS and PROFINET can help to cut costs in all areas. Our practical experience is the key factor! PROCENTEC offers different types of PROFIBUS and PROFINET training modules which are organised on a regular basis.

PROCENTEC is a professional organisation, which is involved in PROFIBUS and PROFINET technology 24-hours a day. It has the availability of experts who are constantly deployed worldwide. Not only is the tried and tested automation technology ideal for the use in both Factory and Process automation, but support is also ensured through the products and services of PROCENTEC.

www.procentec.com

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9 Certificates

PROFIBUS - PROFINET

Certificate

PROFIBUS Nutzerorganisation e.V. grants to

PROCENTEC
Turfschipper, 2292JC Wateringen, The Netherlands

the Certificate No: **Z01831** for the PROFIBUS device:

Model Name:	**SIO4DP**
Revision:	**1.0; SW/FW: 1.0.1; HW: 1.4**
GSD:	**PROC6960.GSD, File Version: 22-10-2013**

This certificate confirms that the product has successfully passed the certification tests with the following scope:

☑	DP-V0	MS0, Sync, Freeze, Fail Safe, Set Slave Add
☑	DP-V1	MS1, MS2, I&M
☑	Physical Layer	RS485

Test Report Number: **PCN175-DP5-01**
Authorized Test Laboratory: **PROCENTEC, Wateringen, The Netherlands**

The tests were executed in accordance with the following documents:
"Test Specifications for PROFIBUS DP Slaves, Version 3.09, September 2008".
This certificate is granted according to the document:
"Framework for testing and certification of PROFIBUS and PROFINET products".
For all products that are placed in circulation by January 21, 2017 the certificate is valid for life.

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(Karsten Schneider)

(K.-P. Lindner)

PROFIBUS

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QualityMasters
ISO Certificering

certificate

QualityMasters hereby declares that

Procentec B.V.
Wateringen

has a management system that meets the requirements of the standard

NEN-EN-ISO 9001:2008

for the scope

Providing training courses, technical support, product development and the exploitation of the test laboratory.

Date of original approval	10-02-2003
Date of issue	10-04-2013
Valid until	10-02-2016
Certificate number	NL 6313uk

On behalf of Stichting QualityMasters,

CONTROLLED
COMMISSIE WAARBORGING DEUGDELIJKHEID

571718

N.B. The failure to meet the conditions as set forth in the certification agreement, or non-compliance with the given standard and/or guidelines, may lead to the suspension or cancellation of the certificate.
This certificate remains the property of Stichting QualityMasters, Nieuwland Parc 157, 3351 LJ Papendrecht.

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PI
PROFIBUS • PROFINET

Certificate
for a PI Competence Center

PI confirms that

PROCENTEC
Dennis van Booma
Turfschipper 41
2292 JC Wateringen
THE NETHERLANDS

is a fully accredited PI Competence Center for
PROFIBUS basic
PROFIBUS PA.

This certificate is granted according to the Quality of Services Agreement for PI Competence Centers and is valid until December 31, 2013.

(Official in Charge)

Chairmen of PI

(Jörg Freitag, Chairman)

(Michael J. Bryant, Deputy Chairman)

PROFIBUS

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PI
PROFIBUS • PROFINET

Certificate
for a PI Training Center

PI confirms that

PROCENTEC
Turfschipper 41
2292 JC Wateringen
THE NETHERLANDS

is a fully accredited PI Training Center for
PROFIBUS Installers, Engineers & PA Engineers.

Instructors:

Dennis van Booma	Elmer Vis	Mark de Brabander
Dave van Cappelle	Fedor Meyer	Paulo Silva
Joost van der Nat	Sander Vermin	Alois Schenkeveld
Edward Dumay	Aad Onderwater	

This certificate is granted according to the Quality of Services Agreement for PI Training Centers and is valid until December 31, 2014.

(Official in Charge)

Chairmen of PI

(Karsten Schneider, Chairman)

PROFIBUS®

(Michael J. Bryant, Deputy Chairman)

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PI
PROFIBUS • PROFINET

Certificate

Authorization as PI Test Laboratory for PROFIBUS

PROFIBUS Nutzerorganisation e.V. accepts
PROCENTEC
Turfschipper 41
2292 JC Wateringen
The Netherlands

as authorized PI Test Laboratory for:

PROFIBUS Slave Devices

PA Profile Devices

The authorization is based on the assessment dated March 20, 2013, and the related assessment report.

The execution of the tests aimed in the PROFIBUS certification shall be conform to the PROFIBUS Standard and the valid guidelines.

This authorization is valid until December 31, 2014.

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(K. Schneider) (K.-P. Lindner)

PROFIBUS®

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10 Revision History

Version 1.0
Initial release.

Version 1.1
- Updeated the Certificates chapter with the certificate of PROFIBUS International PNO
- Updated the address of PROCENTEC Headquarters
- Updated the Distributors chapter

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11 Notes

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Other PROCENTEC products

PROFINET Cable Tester

- ✓ Suitable for 4- and 8-wire PROFINET and regular Ethernet cables
- ✓ Suitable for straight and 90°, metal or plastic PROFINET plugs
- ✓ Tests cable shielding
- ✓ Detects short circuits, wire breaks, swaps, miswiring and split pairs
- ✓ Large LCD clearly indicates the test results
- ✓ 150 hours on one 9 V battery
- ✓ Operating temperature: 0 to 50 °C
- ✓ Just 1-key-press to start continuous testing
- ✓ It can also test telephone and coax cable

www.profinetcabletester.com

Compact PROFIBUS Repeater

- ✓ Single channel PROFIBUS repeater
- ✓ ent
- ✓ Increased signal strength
- ✓ 12 Mbps
- ✓ Auto baudrate detection
- ✓ Redundant power supply
- ✓ Digital glitch filtering
- ✓ No limit in cascading
- ✓ Integrated switchable termination
- ✓ Diagnostic LEDs
- ✓ DB9 connector for measurements
- ✓ **IP 20 with DIN-rail mounting**

www.procentec.com/profihub/b1/en

Other PROCENTEC products

ProfiHub B5

- ✓ 5 Isolated channels
- ✓ Transparent
- ✓ Increased signal strength
- ✓ 31 devices per channel
- ✓ 12 Mbps
- ✓ 1200 m spur line length
- ✓ No address required
- ✓ Integrated switchable termination
- ✓ LEDs to indicate termination is ON
- ✓ Screw terminals and DB9 connectors
- ✓ **IP 20 with DIN-rail mounting**

ProfiHub A5

- ✓ 5 Isolated channels
- ✓ Transparent
- ✓ Increased signal strength
- ✓ 31 devices per channel
- ✓ 12 Mbps
- ✓ 1200 m spur line length
- ✓ No address required
- ✓ Integrated switchable termination
- ✓ **IP 65 classification**

www.procentec.com/profihub

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